CLAIMS

What we claim as our invention is:

1. A method of separating an oligomerization reactor effluent, comprising:

   (a) flashing the oligomerization reactor effluent into a liquid portion and a vapor portion;

   (b) distilling the portions of the oligomerization reactor effluent; and

   (c) recovering an oligomerization product stream.

2. The method of claim 1, wherein the oligomerization reactor effluent is from a trimerization reactor.

3. The method of claim 1, wherein the oligomerization reactor effluent is from trimerization of ethylene to 1-hexene.

4. The method of claim 3, wherein the oligomerization reactor effluent comprises a solvent.

5. The method of claim 4, wherein the solvent comprises an aliphatic solvent, an aromatic solvent, or combinations thereof, having from about 3 to 9 carbon atoms.

6. The method of claim 4, wherein the solvent comprises cyclohexane, methylcyclohexane, hexane, 1-hexene, C_7 hydrocarbons, isobutane, propane, or mixtures of two or more thereof.

7. The method of claim 4, wherein the solvent comprises cyclohexane.

8. The method of claim 7, wherein the oligomerization reactor effluent comprises a catalyst system.

9. The method of claim 8, wherein the catalyst system comprises a chromium source, a pyrrole-containing compound, a methyl alkyl, and a halide source.

10. The method of claim 9 further comprising killing the catalyst system prior to step 1(b).

11. The method of claim 10, wherein the catalyst system is killed with an alcohol, an amine, or combinations thereof.

12. The method of claim 10, wherein the catalyst system is killed with an alcohol having eight to twelve carbon atoms per molecule.

13. The method of claim 10, wherein the catalyst system is killed with C_8 alcohol.

14. The method of claim 1, wherein the oligomerization product stream comprises 1-hexene and solvent.

15. The method of claim 1, wherein the oligomerization reaction effluent is flashed by pressure reduction.

16. The method of claim 1, wherein the distilling is performed in a common distillation column.

17. The method of claim 16, wherein the liquid portion is fed to the distillation column at a liquid feed inlet on the distillation column and the vapor portion is fed to the distillation column at a vapor feed inlet on the distillation column.

18. The method of claim 16, wherein the oligomerization product stream is withdrawn from a side draw outlet of the distillation column.

19. The method of claim 18, wherein the side draw outlet is located below the vapor feed inlet and above the liquid feed inlet on the distillation column.

20. The method of claim 19 further comprising a number of stages between the liquid feed inlet and the side draw outlet effective to separate heavies from the oligomerization product stream.

21. The method of claim 19 further comprising a number of stages between the vapor feed inlet and the side draw outlet effective to separate lights from the oligomerization product stream.

22. The method of claim 19 further comprising separating 1-hexene and cyclohexane from the oligomerization product stream.

23. The method of claim 1, wherein the oligomerization reactor effluent comprises:

from about 15 to about 30 wt. % 1-hexene,

from about 5 to about 15 wt. % ethylene,

from about 50 to about 80 wt. % cyclohexane,

from about 5 to about 20 wt. % lights, and

from about 0 to about 3 wt. % heavies.

24. The method of claim 1, wherein the liquid portion comprises:

from about 15 to about 30 wt. % 1-hexene,

from about 0 to about 5 wt. % ethylene,

from about 50 to about 80 wt. % cyclohexane,

from about 0 to about 5 wt. % lights , and

from about 0 to about 5 wt. % heavies.

25. The method of claim 1, wherein the vapor portion comprises:

from about 15 to about 25 wt. % 1-hexene,

from about 25 to about 50 wt. % ethylene,

from about 20 to about 40 wt. % cyclohexane,

from about 25 to about 50 wt. % lights , and

from about 0 to about 0.5 wt. % heavies.

26. The method of claim 1, wherein the oligomerization product stream comprises:

from about 15 to about 30 wt. % 1-hexene,

from about 0 to about 0.1 wt. % ethylene,

from about 70 to about 85 wt. % cyclohexane,

from about 0 to about 0.1 wt. % lights , and

from about 0 to about 1 wt. % heavies.

27. A method of separating an oligomerization reactor effluent, comprising:

(a) feeding a liquid portion of the oligomerization reactor effluent to a first inlet on a distillation column;

(b) feeding a vapor portion of the oligomerization reactor effluent to a second inlet on a distillation column located above the first inlet; and

(c) withdrawing an oligomerization product stream from a side drawn outlet located between the first and second inlets.

28. A system for separating an oligomerization reactor effluent comprising:

(a) a vapor/liquid separator to flash the oligomerization reactor effluent into a vapor portion and a liquid portion; and

(b) a distillation column in fluid communication with the vapor/liquid separator, wherein the distillation column has a side draw for withdrawing an oligomerization product stream and receives as separate feeds the vapor portion and the liquid portion from the vapor/liquid separator.

29. The system of claim 28, wherein the liquid portion is fed to the distillation column at a location below the side draw.

30. The system of claim 29, wherein the vapor portion is fed to the distillation column at a location above the side draw.

31. The system of claim 28 further comprising a trimerization reactor for providing the oligomerization reactor effluent, wherein the trimerization reactor is in fluid communication with the vapor/liquid separator.

32. The system of claim 28, wherein the vapor/liquid separator is positioned at an elevation higher than the liquid feed on the distillation column to create a hydrostatic head for flow into the distillation column.

33. The system of claim 28 further comprising a second distillation column in fluid communication with the side draw of the first distillation column, wherein the second distillation column separates trimerization product from solvent.

34. The system of claim 28, wherein the distillation column has at least 3 off-takes and at least 2 inputs.

35. An oligomerization product made by the method of claim 1.